Elastomeric microelectrode array for *in vitro* brain

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Challenge/Problem:

To develop microelectrode arrays capable of simultaneous mechanical stimulation and electrophysiological recording of living brain tissue *in vitro.* The stretchable microelectrode array (SMEA) will enable fundamental new studies in the fields of mechano-biology and traumatic brain injury research, to complement *in vivo* studies. The SMEA will be compatible with the long-term study of neuronal function pre-, during, and post-mechanical stimulation.

Progress:

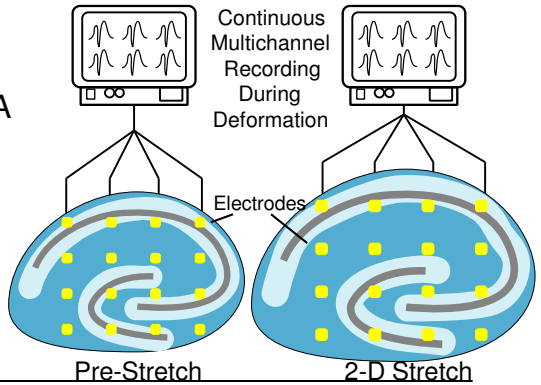
SMEAs of 2X2 arrays with electrode dimensions of 100μm X 100μm and 2X2 encapsulated arrays of 1mm X 1mm electrodes have been fabricated and interfaced with a commercial MEA system. Electrical impedance and test signals have been measured under biaxial stretch.

Approach:

We have recently discovered that certain metal films patterned on compliant elastomeric substrates remain electrically conducting under large, repeated, and sudden stretching and relaxation. Using microelectronics fabrication processes, patterns of metal electrodes will be evaporated onto a silicone substrate and encapsulated with a photopatternable silicone.

Near Term Products:

Encapsulated 2X2 SMEA with 100μm X 100μm recording electrodes



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Future Plans:

1) Recording of electrophysiological signals from organotypic hippocampal slice cultures pre-, during, and post-stretch.
2) Refinement of the patterning techniques to produce a 4 X 4 SMEA with electrode dimensions of less than 50μm X 50μm.

Keywords: microelectrode array, electrophysiology, traumatic brain injury, mechanical stimulation